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DRAFT

Assessment of Qualification for Treatment under the Arizona Natural and Exceptional Events Policy for the High Particulate (PM₁₀) Concentration Events in the Phoenix and Yuma Areas on May 21, 2008

Background

The Arizona Department of Environmental Quality (ADEQ) issues Dust Control Action Forecasts for the Yuma and Phoenix areas as part of their Natural Events Action Plan. On Tuesday May 20, 2008, in response to an approaching trough of low pressure, ADEQ air quality forecasters issued the Maricopa County Dust Control Action Forecast calling for a high risk of wind-blown dust for Wednesday May 21st in Maricopa County. In anticipation of this potential wind-blown dust event, ADEQ also issued a High Pollution Advisory for Maricopa County for May 21, 2008. The approaching trough was forecast to impact the Yuma area as well. Because of this, ADEQ air quality forecasters called for a high risk of wind-blown dust in their Yuma and Vicinity Dust Control Action Forecast for Wednesday May 21st. This potential wind event equated to a significant risk of exceeding the PM₁₀ National Ambient Air Quality Standards (NAAQS) in both Yuma and Maricopa County. The forecasts/advisories satisfy the requirement in 40 CFR 51.920(a)(1).

The forecast for May 21st for both Maricopa County and Yuma called for winds sustained at 20-30 mph with the possibility of gusts greater than 40 mph capable of producing significant wind-blown dust. This potential wind-blown dust event equated to a high risk of exceeding the PM₁₀ National Ambient Air Quality Standards (NAAQS) in Maricopa County. Strong winds did occur

and were observed in the Phoenix Metro and the Yuma areas on May 21st, 2008. Beginning in the morning and continuing through the evening hours of May 21st, strong southwesterly and westerly winds in Phoenix, and strong west-northwesterly winds in Yuma, generated areas of blowing dust. All appropriate State Implementation Plan (SIP) control measures were in place during the event demonstrating, per 40 CFR 50.1(j), that the event "is not reasonably controllable or preventable."

The initialization of a wind-blown dust event is evident in the Phoenix visible camera images as well as the Arizona Meteorological Network (AzMET) and National Weather Service (NWS) monitors (see Fig. 1). Strong winds gusting to over 25 mph and as high as 37 mph were reported at the NWS Luke Air Force Base monitoring location, while Yuma locations measured wind gusts up to 37 mph as well during that same time period. This significant event brought elevated ambient concentrations of PM₁₀ to the Phoenix and Yuma areas that exceeded the NAAQS at the West 43rd Ave. and Yuma Courthouse monitors. The fact that ambient concentrations exceed the NAAQS satisfies the criteria in 40 CFR 50.1(j) that the event "affects air quality." The following are the key PM₁₀ monitor readings for the monitors examined in this report:

Monitor (Operator/Type)	AQS ID	24-hr Avg PM ₁₀	1-hr Max PM ₁₀	Max Time	Flag**
YUMA AREA					
Yuma Courthouse (ADEQ/TEOM)	04-027-0004*	164	504	1700	A or RJ
PHOENIX METRO AREA					
West 43rd Ave (MC/TEOM)	04-013-4009*	279	1208	0900	A or RJ
Durango Complex (MC/TEOM)	04-013-9812*	110	310	0900	None
Greenwood (MC/TEOM)	04-013-3010*	89	219	0900	None
South Phoenix (MC/TEOM)	04-013-4003*	122	334	0900	None

* EPA Air Quality System Identification Number

** 24-hr PM₁₀ concentration influenced by natural or exceptional event to be flagged.

Type Abbreviations: BAM – Beta-Attenuation Mass Monitor (Continuous monitor)

TEOM – Tapered Element Oscillating Microbalance Monitor (Continuous monitor).

The preliminary findings from this analysis were presented at a stakeholders meeting on November 19, 2008, in Phoenix, Arizona. Following this stakeholders meeting, ADEQ will finalize this demonstration and solicit public

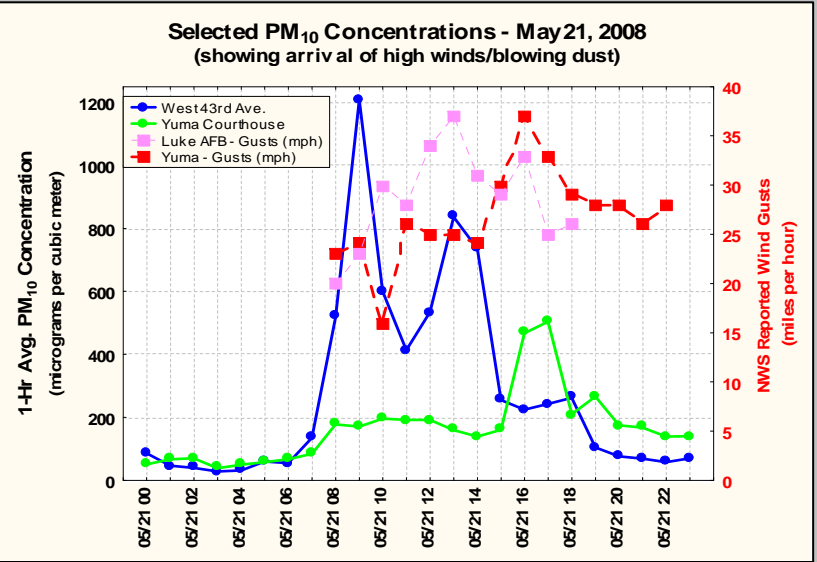
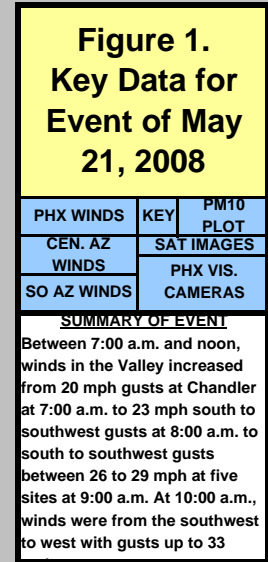
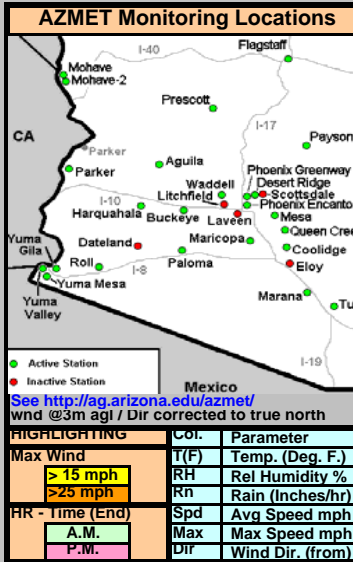
comment on the final demonstration. Any comments that are received will be forwarded to EPA with this demonstration pursuant to 40 CFR 50.14(c)(3)(i).

NORTH PHOENIX						
Hr	T(F)	RH	Rn	Spd	Max	Dir
1	88	16	-	5	11	SW
2	83	20	-	5	10	SW
3	81	20	-	5	10	SW
4	79	22	-	4	9	SW
5	77	24	-	3	9	S
6	73	29	-	1	3	S
7	76	26	-	1	6	SW
8	79	20	-	6	13	SW
9	81	17	-	9	19	SW
10	82	18	-	11	23	SW
11	84	19	-	11	21	SW
12	85	17	-	11	18	SW
1	87	16	-	12	21	SW
2	88	12	-	12	22	W
3	88	9	-	13	26	SW
4	88	9	-	13	21	SW
5	88	9	-	11	25	W
6	87	8	-	10	18	SW
7	85	9	-	10	19	W
8	82	9	-	8	16	SW
9	81	10	-	7	15	SW
10	79	11	-	6	14	W
11	78	14	-	5	11	NW
12	75	19	-	2	5	W

NWS-Luke AFB						
Hr	T(F)	VR	Dust	Spd	Gust	Dir
1	84	10	-	14	14	SW
2	80	10	-	13	13	SW
3	79	10	-	15	15	SW
4	79	10	-	14	14	S
5	75	10	-	7	7	SW
6	75	10	-	10	10	S
7	77	10	-	11	11	SW
8	81	10	-	17	17	SW
9	85	10	-	20	20	SW
10	86	10	-	23	23	SW
11	87	10	-	21	30	SW
12	89	10	-	21	28	SW
1	91	10	-	9	34	SW
2	91	10	-	26	37	W
3	91	10	-	20	31	W
4	91	10	-	22	29	W
5	89	10	-	17	33	W
6	88	10	-	20	25	W
7	85	10	-	21	26	SW
8	83	10	-	16	16	W
9	82	10	-	16	16	W
10	81	10	-	18	18	NW
11	78	10	-	9	9	W
12	76	10	-	13	13	W

NWS-Yuma MCAS						
Hr	T(F)	VR	Dust	Spd	Gust	Dir
1	82	10	-	0	0	N
2	81	10	-	7	7	W
3	77	10	-	6	6	S
4	77	10	-	3	3	SW
5	74	10	-	5	5	SW
6	75	10	-	9	9	W
7	76	10	-	5	5	W
8	81	10	-	13	13	W
9	83	10	-	14	23	NW
10	85	10	-	16	24	NW
11	87	10	-	16	16	NW
12	89	9	-	18	26	W
1	92	9	-	14	25	NW
2	93	10	-	16	25	W
3	95	10	-	17	24	NW
4	95	10	-	20	30	W
5	91	4	BLDU	29	37	W
6	87	4	BLDU	26	33	W
7	83	9	-	21	29	W
8	80	9	-	21	28	W
9	77	10	-	18	28	W
10	76	10	-	18	26	W
11	75	10	-	16	28	W
12	74	10	-	15	15	W

Event Contrib. Analysis			
Hourly PM ₁₀ Conc. (µg/m ³)			
MONITORS:	Hr	1	2
1-W43RD	1	87	51
2-YUMA CH	2	47	67
3-Mon 3	3	40	71
24-Hr. Avg PM ₁₀	5	32	49
with I/w/o	6	60	58
Monitor: Event	7	55	67
1-W43RD	8	135	84
2-YUMA	9	519	178
1-W43RD	10	1208	171
2-YUMA	11	601	196
> NAAQS	12	413	192
< NAAQS	1	535	192
Pink=Event Contrib.	2	837	160
Conclusion: As shown above, the PM ₁₀ concentration would have been below the NAAQS "BUT FOR" the event contribution (hours highlighted in pink).	3	735	140
	4	255	161
	5	225	467
	6	243	504
	7	263	210
	8	105	266
	9	77	175
	10	69	168
	11	58	139
	12	70	140

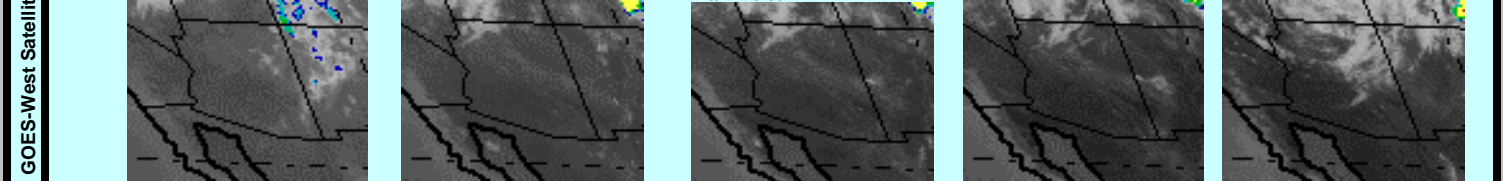


PARKER						
Hr	T(F)	RH	Rn	Spd	Max	Dir
1	79	27	-	12	17	S
2	75	31	-	11	15	S
3	74	31	-	6	11	S
4	74	32	-	7	14	S
5	73	33	-	7	10	S
6	76	27	-	8	17	SW
7	78	25	-	16	28	W
8	78	22	-	18	31	W
9	80	19	-	22	32	NW
10	81	16	-	21	30	NW
11	84	15	-	20	27	NW
12	85	15	-	18	26	NW
1	87	14	-	18	24	NW
2	88	13	-	17	24	NW
3	89	12	-	15	26	W
4	89	12	-	15	26	W
5	87	12	-	13	20	W
6	87	12	-	13	20	W
7	86	13	-	11	19	NW
8	83	13	-	15	25	NW
9	81	14	-	16	26	NW
10	78	15	-	14	22	NW
11	77	16	-	15	23	NW
12	75	16	-	13	18	NW

SOUTHEAST PHOENIX						
Hr	T(F)	RH	Rn	Spd	Max	Dir
1	79	24	-	4	7	S
2	70	39	-	3	6	E
3	71	33	-	4	5	SE
4	65	48	-	3	6	S
5	65	44	-	5	7	S
6	63	47	-	4	7	SE
7	69	35	-	5	8	SE
8	76	27	-	8	18	S
9	82	18	-	12	20	S
10	85	13	-	13	24	SW
11	86	15	-	12	25	SW
12	87	17	-	14	26	W
1	87	19	-	15	27	W
2	86	19	-	16	30	W
3	85	18	-	16	27	W
4	86	16	-	16	28	W
5	85	14	-	17	26	W
6	84	12	-	16	27	W
7	82	13	-	13	20	W
8	80	14	-	13	24	W
9	78	12	-	9	16	W
10	77	12	-	8	15	W
11	75	14	-	10	17	W
12	74	21	-	12	19	SW

MARICOPA						
Hr	T(F)	RH	Rn	Spd	Max	Dir
1	75	29	-	4	6	S
2	73	30	-	3	6	SE
3	72	29	-	3	6	SE
4	71	31	-	4	9	S
5	69	29	-	4	8	SE
6	68	29	-	6	10	S
7	73	25	-	8	15	S
8	79	19	-	13	22	S
9	83	17	-	14	21	S
10	88	13	-	14	22	SW
11	90	12	-	17	27	W
12	90	14	-	17	27	W
1	90	13	-	18	34	W
2	90	12	-	18	27	W
3	90	11	-	18	29	W
4	90	10	-	17	29	W
5	89	10	-	17	30	W
6	88	10	-	14	22	W
7	85	11	-	14	21	W
8	83	11	-	10	18	W
9	80	10	-	6	12	W
10	77	13	-	7	13	W
11	76	18	-	7	13	W
12	74	25	-	10	16	W

Historical Distribution			
5-Yr. Dist. of Values (µg/m ³)			
MONITORS:	Column Index		
1-WEST FORTY THIRD	Yr - All Data (5-Yrs)		
2-YUMA COURTHOUSE	Sea - Data for Spring season only (5-Yrs)		
Cum. Freq.	Mon 1	Mon 2	
Yr	Yr	Sea	Sea
5	8	8	8
0.5%	9	12	9
1.0%	11	14	14
2.5%	15	16	16
5%	19	19	19
10%	29	23	22
25%	44	31	29
50%	65	42	40
75%	91	57	51
90%	121	77	76
95%	139	96	109
97.5%	157	127	182
99.0%	192	186	210
99.5%	227	211	212
Max	313	349	349
Flagged Value	279	164	
Conclusion: Flagged Value is exceptional			



Assessment under the Technical Criteria Document (TCD)

1. Properly qualify and validate the air quality measurement to be flagged. As this was not a filter sampling date (1-in-6 run day), only data from the continuous analyzers were examined. The air quality monitoring data were reviewed by the agency responsible for operation of the monitor. All hourly PM₁₀ readings from the West 43rd Ave. and Yuma Courthouse monitoring sites were valid for May 21st. Audits of the analyzers revealed operations were within acceptable tolerance. No local sources were reported as significantly contributing to the air quality episode. Exceedances of the NAAQS were recorded at the West 43rd Ave. and Yuma Courthouse monitoring sites operated by Maricopa County and ADEQ respectively.

2. Review suspected contributing sources. The NWS and AzMET surface data for Arizona, along with the visible camera images in Phoenix, provide a good explanation as to what meteorological conditions were in place on May 21st. Strong westerly to southwesterly winds were occurring in the Phoenix area due to a low pressure system approaching from the west with a cold front situated over Arizona. PM₁₀ concentrations also spiked at the Yuma Courthouse monitor between the 8:00 a.m. and 9:00 p.m. hours, roughly coincident with the spikes recorded at the West 43rd Ave. monitor. The plot of hourly PM₁₀ concentration data in the upper right corner of Figure 1 confirms the nearly identical timing of the elevated PM₁₀ concentrations recorded at West 43rd Ave. and Yuma Courthouse and the strong wind gusts at Luke Air Force Base and Yuma Marine Corps Air Station (MCAS).

3. Examine all air quality monitoring information. Data from all monitors in the network were reviewed. Monitors from the affected areas are summarized in the table in the Background section of this assessment. Pursuant to 40 CFR 50.14(c)(3)(iii)(C), the “Historical Distribution” Table in Figure 1 has been included to demonstrate that the event is associated with a measured concentration in excess of normal historical fluctuations, including background (i.e., concentrations greater than the 95th percentile). Monitors with readings greater than that of the NAAQS on May 21, 2008, which should be flagged, include West 43rd Ave. and Yuma Courthouse.

4. Examine the meteorological conditions before and during the event. The AzMET meteorological data are summarized in Figure 1. The wind data are highlighted yellow if the max wind speed in the hour exceeds 15 mph

and orange if it exceeds 25 mph. As can be seen in Figure 1, wind speeds did not pick up in central and southern Arizona until approximately 8:00 a.m., when several stations reported gusty winds over 20 mph. This timing corresponds to the onset of elevated PM₁₀ concentrations recorded at the West 43rd Ave. and Yuma Courthouse monitoring sites, both of which remained elevated through the afternoon and into the evening hours.

5. Perform a qualitative attribution to emission source(s). All evidence indicates the elevated PM₁₀ concentrations in the Phoenix area can be attributed to soil emissions that were transported over portions of the Phoenix Metro area in Maricopa County. No source specific emission allocation is possible based on the data available for analysis. The hourly concentration data do not show any significant source other than the wind-blown dust event occurring on May 21, 2008. Visual evidence of reduced visibility can be seen in the images located in the lower right portion of Figure 1. These images provide proof that the elevated PM₁₀ concentrations in Phoenix were coincident with strong gusty winds and can be attributed to soil emissions. In addition, visibility was reduced to 4 miles and blowing dust was reported by trained weather spotters at the Yuma MCAS during the late afternoon and early evening hours. These observations provide further proof that the elevated PM₁₀ concentrations recorded by the Yuma Courthouse monitor were the result of a wind-blown dust event.

6. Estimation of Contribution from Source or Event. The primary source appears to be wind-blown dust over central Arizona for which there is not an effective or efficient method to estimate the relative contributions from specific sources. The demonstration analysis contained in this report establishes the linkage between the measurements to be flagged and the event, thus satisfying the requirement in 40 CFR 50.14(c)(3)(iii)(B). Pursuant to 40 CFR 50.14(c)(3)(iii)(D), the “Event Contrib. Analysis” Table in Figure 1 has been included to demonstrate that there would have been no exceedances or violations but for the event (i.e., the contribution during the event overwhelmed the 24-hour averages).

7. Determination that a Natural or Exceptional Event Contributed To an Exceedance. Based on this analysis, the event satisfies the requirement in 40 CFR 50.1(j) that the elevated concentrations at West 43rd Ave. and the Yuma Courthouse were attributed to a natural event.

Conclusion

Long-range transport of dust from soils. The region wide elevated PM₁₀ event on May 21, 2008 in Yuma and Maricopa Counties was the result of the transport of dust and soils from winds that suspended natural soils and soils from areas where Best Available Control Measures are in place and should be flagged for air quality planning

purposes. The “high wind” flag (A or RJ) should be applied to the monitor readings indicated in the table at the beginning of this report, as the monitor would have been below the NAAQS but for the contribution of the event.